

## CLAIMS

1. A transmitter comprising:

amplitude calculating means for calculating an  
5 amplitude of an input modulating signal;

distortion compensation data storage means for  
storing distortion data on a normal characteristic or  
a reverse characteristic to carry out a distortion  
compensation for the input modulating signal;

10 distortion compensating means for reading the  
distortion data on the normal characteristic or the  
reverse characteristic from the distortion compensation  
data storage means based on an output of the amplitude  
calculating means and multiplying or dividing the input  
15 modulating signal and the distortion data to carry out  
the distortion compensation;

quadrature modulating means for carrying out a  
quadrature modulation in response to an output of the  
distortion compensating means;

20 variable gain amplifying means for amplifying an  
output of the quadrature modulating means to control a  
gain based on a gain control signal;

power amplifying means serving to carry out a power  
amplification for an output of the variable gain  
25 amplifying means and having a linear mode for carrying

out the power amplification by using a linear operating region in an input/output power characteristic and a saturation mode for carrying out the power amplification by using a saturation operating region in the input/output power characteristic; and

amplitude modulating means for inputting an amplitude component of the output of the distortion compensating means to an output controlling input terminal of the power amplifying means, thereby carrying out a polar coordinate modulation,

wherein the input modulating signal and the distortion data on the normal characteristic are multiplied or the input modulating signal and the distortion data on the reverse characteristic are divided in the distortion compensating means in the case in which the power amplifying means is operated in the saturation mode to carry out the polar coordinate modulation, and the input modulating signal and the distortion data on the normal characteristic are divided or the input modulating signal and the distortion data on the reverse characteristic are multiplied in the distortion compensating means in the case in which the power amplifying means is operated in the linear mode to carry out a linear amplification.

2. A transmitter comprising:

amplitude calculating means for calculating an amplitude of an input modulating signal;

normal and reverse distortion compensation data  
5 storage means for storing distortion data on a normal characteristic and a reverse characteristic to carry out a distortion compensation for the input modulating signal;

distortion compensating means for reading the  
10 distortion data on the normal characteristic or the reverse characteristic from the normal and reverse distortion compensation data storage means based on an output of the amplitude calculating means and multiplying the input modulating signal and the distortion data to  
15 carry out the distortion compensation;

quadrature modulating means for carrying out a quadrature modulation in response to an output of the distortion compensating means;

variable gain amplifying means for amplifying an  
20 output of the quadrature modulating means to control a gain based on a gain control signal;

power amplifying means serving to carry out a power amplification for an output of the variable gain amplifying means and having a linear mode for carrying  
25 out the power amplification by using a linear operating

region in an input/output power characteristic and a saturation mode for carrying out the power amplification by using a saturation operating region in the input/output power characteristic; and

5           amplitude modulating means for inputting an amplitude component of the output of the distortion compensating means to an output controlling input terminal of the power amplifying means, thereby carrying out a polar coordinate modulation,

10           wherein the input modulating signal and the distortion data on the normal characteristic are multiplied in the distortion compensating means in the case in which the power amplifying means is operated in the saturation mode to carry out the polar coordinate modulation, and the input modulating signal and the distortion data on the reverse characteristic are multiplied in the distortion compensating means in the case in which the power amplifying means is operated in the linear mode to carry out a linear amplification.

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3. A transmitter comprising:

quadrature modulating means for inputting an in-phase component and a quadrature component of an input modulating signal, thereby carrying out a quadrature modulation;

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variable gain amplifying means for amplifying an output of the quadrature modulating means to control a gain based on a gain control signal;

power amplifying means serving to carry out a power  
5 amplification for an output of the variable gain amplifying means and having a linear mode for carrying out the power amplification by using a linear operating region in an input/output power characteristic and a saturation mode for carrying out the power amplification  
10 by using a saturation operating region in the input/output power characteristic;

amplitude calculating means for calculating an amplitude of the input modulating signal;

amplitude modulating means for inputting an  
15 amplitude component of the input modulating signal to an output controlling input terminal of the power amplifying means, thereby carrying out a polar coordinate modulation;

amplitude distortion data storage means for storing  
20 distortion data for the amplitude of the input modulating signal; and

distortion adding means for reading the distortion data from the amplitude distortion data storage means based on an output of the amplitude calculating means  
25 and multiplying the amplitude of the input modulating

signal and the distortion data in the case in which the power amplifying means is operated in the saturation mode to carry out the polar coordinate modulation.

5     4.     A transmitter comprising:

          quadrature modulating means for inputting an in-phase component and a quadrature component of an input modulating signal, thereby carrying out a quadrature modulation;

10          first variable gain amplifying means for a distortion control which serves to amplify an output of the quadrature modulating means, thereby controlling a gain based on a distortion control signal;

          second variable gain amplifying means for a gain  
15          control which serves to amplify an output of the first variable gain amplifying means, thereby controlling a gain based on a gain control signal;

          power amplifying means serving to carry out a power amplification for an output of the second variable gain  
20          amplifying means and having a linear mode for carrying out the power amplification by using a linear operating region in an input/output power characteristic and a saturation mode for carrying out the power amplification by using a saturation operating region in the  
25          input/output power characteristic;

amplitude detecting means for detecting an amplitude of the output of the first variable gain amplifying means; and

amplitude modulating means for inputting an output  
5 of the amplitude detecting means to an output controlling input terminal of the power amplifying means, thereby carrying out a polar coordinate modulation.

5. A transmitter comprising:

10 a polar coordinate transforming portion for transforming an input modulating signal constituted by an in-phase component and a quadrature component into an amplitude signal and a phase signal;

distortion data storage means for storing  
15 distortion data to add a distortion to the amplitude signal and the phase signal;

distortion adding means for reading the distortion data from the distortion data storage means based on the amplitude signal and adding a distortion to the amplitude  
20 signal and the phase signal;

distortion compensation data storage means for storing two types of distortion data to carry out a distortion compensation for amplitude signal and phase signal outputs of the distortion adding means;

25 distortion compensating means for selecting and

reading any of the distortion data from the distortion compensation data storage means based on the amplitude signal output of the distortion adding means and carrying out a distortion compensation for the amplitude signal and phase signal outputs of the distortion adding means;

5        rectangular coordinate transforming means for transforming any of an amplitude signal output of the distortion compensating means, a fixed value output and the amplitude signal output of the distortion adding means and a phase signal output of the distortion compensating means into an in-phase component and a quadrature component;

10        quadrature modulating means for carrying out a quadrature modulation in response to an output of the rectangular coordinate transforming means;

15        variable gain amplifying means for amplifying an output of the quadrature modulating means to control a gain based on a gain control signal;

20        power amplifying means serving to carry out a power amplification for an output of the variable gain amplifying means and having a linear mode for carrying out the power amplification by using a linear operating region in an input/output power characteristic and a saturation mode for carrying out the power amplification

25        by using a saturation operating region in the



input/output power characteristic; and

amplitude modulating means for inputting an amplitude component of the output of the distortion compensating means to an output controlling input  
5 terminal of the power amplifying means, thereby carrying out a polar coordinate modulation,

wherein an amplitude signal input to the rectangular coordinate transforming means is set to be the fixed value or the amplitude output in the distortion  
10 adding means in the case in which the power amplifying means is operated in the saturation mode to carry out the polar coordinate modulation, and is set to be the amplitude output in the distortion compensating means in the case in which the power amplifying means is  
15 operated in the linear mode to carry out a linear amplification.

6. The transmitter according to claim 5, wherein when the power amplifying means is to be operated in the  
20 saturation mode to carry out the polar coordinate modulation, the amplitude signal input to the rectangular coordinate transforming means is set to be a fixed value if an operating mode is a cellular system communication and is set to be an amplitude output in the distortion  
25 adding means in case of a WLAN system communication.

7. The transmitter according to any of claims 1 to 6,  
wherein the power amplifying means carries out the polar  
coordinate modulation when a transmitting output power  
5 is on a maximum output level or in the vicinity thereof,  
and carries out the linear amplification when the  
transmitting output power is lower than the transmitting  
power.
- 10 8. The transmitter according to any of claims 1 to 7,  
wherein the power amplifying means comprises a  
power terminal to be used as the output controlling input  
terminal; and  
wherein the transmitter further comprises a power  
15 driver which serves to increase a current capacity of  
the signal on the predetermined level or a signal  
subjected to an amplitude modulation based on the  
amplitude component of the input modulating signal and  
to supply a power as a transmitting output control signal  
20 to the power terminal.
9. A radio communicating device comprising the  
transmitter according to any of claims 1 to 8.